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Grzegorz Lechowski

**Beyond “dependent development”
in a high-tech industry?**

**The interplay between domestic institutions
and transnational sectoral governance in the
trajectories of emerging Polish IT firms**

Discussion Paper

SP III 2018–302

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The interplay between domestic institutions and transnational sectoral governance in the trajectories of emerging Polish IT firms

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WZB Berlin Social Science Center (2018)

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Abstract

The present study investigates the relatively successful development of the homegrown IT industry in Poland since the early 1990s. The case is theoretically interesting because it runs counter to the dominant perspective on the economic systems in postcommunist Central Europe, which emphasizes the region's dependency on foreign direct investment (FDI) for industrial development. The empirical analysis focuses on the industry's two key players, Asseco and Comarch, which are among Europe's largest enterprise IT (EIT) vendors. It uses rich historical data to reconstruct the firms' strategies regarding sales market operations, corporate finance, and productive organization. The study's main theoretical interest is to explore how the firms' successful development has been shaped by the interplay between home-country institutions and the governance structure of the transnational EIT industry. The analysis indicates, first, that the firms have benefited from a well-functioning local capital market, the domestic supply of high-skilled labor, and some characteristics of the home country sales market. Second, the study reveals that the firms' development has been conditioned by the ongoing modularization processes in the EIT sector. In their initially home market oriented operations, the analyzed firms focused on the downstream segments of the EIT value chain while sourcing the more high-tech components (e.g. databases) from collaborations with foreign suppliers. In general, the findings contribute to the discussions on catching-up processes in emerging countries, *first*, by demonstrating the developmental potential related to modularization processes in high-tech industries, and *second*, by drawing attention to how the globally fragmented production regimes intersect with country-specific institutional frameworks.

Key words: varieties of capitalism, sectoral systems of innovation, IT industry, postcommunist Europe, Poland

JEL classification: P12, P16, L86

Über die „abhängige Entwicklung“ hinaus? Wachstumsstrategien aufstrebender polnischer IT-Firmen zwischen lokaler Einbettung und Transnationalisierung der Wertschöpfungsketten

Zusammenfassung

Die vorliegende Studie untersucht eine relativ erfolgreiche Entwicklung der heimischen IT-Industrie in Polen seit den frühen 1990er Jahren. Der analysierte Fall ist von theoretischer Relevanz, da er die dominante Perspektive auf Wirtschaftssysteme im postkommunistischen Mitteleuropa, die eine Abhängigkeit der Region von ausländischen Direktinvestitionen (FDI) in den Vordergrund stellt, problematisiert. Die empirische Analyse fokussiert auf zwei Hauptakteure der polnischen IT-Branche, Asseco und Comarch, die zu den größten Anbietern von Enterprise-IT (EIT) in Europa gehören. Die Analyse baut auf umfangreichen historischen Daten auf, um die Strategien der zwei Unternehmen hinsichtlich Produktmarktpositionierung, Unternehmensfinanzierung und Produktionsorganisation zu rekonstruieren. Das theoretische Hauptinteresse der Studie gilt der Frage, wie die erfolgreiche Entwicklung der zwei Unternehmen durch ein Zusammenspiel von nationalen Institutionen und der Governance-Struktur der globalen EIT-Industrie geprägt wurde. Die Analyse zeigt erstens, dass die Unternehmen von einem gut funktionierenden lokalen Kapitalmarkt, dem inländischen Angebot an hochqualifizierten Arbeitskräften sowie einigen Charakteristiken des Binnenmarktes profitieren haben. Zweitens zeigt die Studie, dass die Entwicklung der Unternehmen durch die Modularisierungsprozesse im globalen EIT-Sektor bedingt war. In ihren anfänglich binnenmarktorientierten Strategien konzentrierten sich die analysierten Unternehmen auf Downstream-Segmente der EIT-Wertschöpfungskette, während sie die Hightech-Komponenten (z. B. Datenbanken) aus Kooperationen mit ausländischen Lieferanten bezogen. Im Allgemeinen tragen die Ergebnisse der Studie zu den Diskussionen über die Aufholprozesse in den Schwellenländern bei, indem sie *erstens* das mit den Modularisierungsprozessen in Hightech-Branchen verbundene Entwicklungspotenzial beweisen und *zweitens* ein Zusammenspiel zwischen modularisierten transnationalen Produktionsregimen und länderspezifischen institutionellen Rahmen aufzeigen.

Schlüsselwörter: Spielarten des Kapitalismus, sektorale Innovationssysteme, IT-Industrie, postkommunistisches Europa, Polen

JEL Klassifikation: P12, P16, L86

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1. Introduction

1.1. *The indigenous IT industry and varieties of economic coordination in Poland*

The Polish IT sector presents an intriguing case for the existing research on postcommunist economic development in Central Europe. In contrast to many industries that, driven by a massive inflow of foreign direct investment (FDI), have recently flourished in the country—notably, the automotive and electronics sectors (Nölke & Vliegenthart, 2009)—the IT industry has created favorable conditions for the growth of indigenous firms. Despite a strong local presence of multinational companies (MNCs) such as IBM, Oracle, or SAP, many homegrown IT enterprises have been able to secure a significant share of the domestic market. According to the current rankings, about 40 to 50 percent of the hundred largest IT firms operating in the country (in terms of revenue) are indigenous companies (see e.g., Computerworld, 2015; ITwiz, 2017). While many of them have specialized in activities requiring few knowledge-intensive inputs, like hardware assembly, distribution, or implementation of third-party software, a few others have focused on the production of proprietary and often innovative IT solutions. Moreover, some of these knowledge-intensive firms—including the two studied in the present paper—have managed to extend their operations to foreign markets.

From a theoretical standpoint, this relative success of homegrown IT companies in Poland presents an interesting case because it runs counter to a large body of literature on economic systems in postcommunist Central Europe¹ that has emphasized the region's dependency on FDI for industrial development (see e.g. Bohle & Greskovits, 2012; King, 2007; King & Szelenyi, 2005; Nölke & Vliegenthart, 2009). Seen from the perspective of these existing studies, after 1989, the Visegrád economies created institutional conditions particularly conducive to the development of foreign-owned industries specializing in noninnovative productive activities. Perhaps the most explicit and rigorous formulation of this viewpoint has been the much-quoted theory of “dependent market economies” (DMEs; Nölke & Vliegenthart, 2009)², which has pointed to the emergence of a specific, FDI-oriented model of industrial governance in the region. As Nölke and Vliegenthart (2009) have argued, this model is centrally characterized by transnational intra-firm hierarchies developed by foreign MNCs in order to benefit from various complementary resources available in the companies' “home” and “host” societies. The MNCs investing in the region benefit from the local institutional structures, which ensure the provision of disciplined and mostly mid-skilled labor. At the same time, the companies bypass the other layers of the host countries' institutional frameworks—for instance, their financial or innovation systems—and, instead, secure the required resources abroad.

Calling into question this currently dominant perspective on industrial development in postcommunist Central Europe, the emergence of a relatively competitive homegrown IT sector in Poland suggests that, apart from FDI, other effective economic-coordination mechanisms that can support the growth of modern local industries may also exist in the region³. Since indigenous IT firms are not subsidiaries of MNCs, their integration into transnational value chains must have occurred differently than in subsidiaries embedded in the intra-firm hierarchies controlled from abroad. At this

¹ In the following, I will be using the terms “postcommunist Central Europe” and “Visegrád countries” (or “economies”) interchangeably, referring to the Czech Republic, Hungary, Poland, and Slovakia.

² The influence of the DME theory has been considerable, as indicated by the over 650 citations the paper by Nölke and Vliegenthart (2009) had received by mid-2018 (listed by Google Scholar).

³ In addition, a further critique of the DME theory focuses on the development of various relatively strong but more “traditional” homegrown sectors in the region—for instance, in the Polish case, the large state-controlled enterprises (SOEs) in the oil, gas, and energy sector, or the dynamically growing furniture industry.

point, we can generally refer to Gereffi, Humphrey, and Sturgeon (2005) who have indicated that there are other modes of cross-border industrial governance—for instance, market-based or modular relations—that may better describe the homegrown Polish IT sector. And regarding their domestic, supply-side institutional embeddedness, successful Polish IT companies—at least the ones focusing on knowledge-intensive productive activities—must have relied on different forms of human capital than the “appeased” mid-skill labor emphasized by Nölke and Vliegenthart (2009). After all, developing more innovative production within the IT sector requires a highly qualified workforce skilled in the latest technologies.

1.2. *The present study: case selection and research problem*

In the present paper, my general goal will be to shed light on the mode of economic coordination that has contributed to the relatively successful growth of the indigenous IT industry in Poland since the 1990s. In particular, I will attempt to find out what institutional structures and related corporate strategies have enabled this development. The empirical analysis will approach the issue *from a microlevel perspective of individual business enterprises*. More specifically, the study will focus on the historical development of two large companies, Asseco and Comarch, which are perceived as the country’s most competitive IT firms (see e.g. PARP, 2017). Hence, the analysis will be a study of two purposively selected “successful” cases.

The two selected firms share various key characteristics with a broader population of relatively large homegrown Polish IT enterprises. For instance, both were established from scratch by private entrepreneurs after 1989 and thus belong to the so-called “de novo” private sector—which is distinct from the MNC or SOE sectors (Martin, 2013). In addition, like most of the country’s major IT players, the two firms have specialized in the provision of software and services to various organizational clients—for instance, in public administration, the financial sector, or private business enterprises⁴. But at the same time, the two companies represent extreme cases in comparison with other domestic IT enterprises in that they have managed to grow large (in terms of both revenues and employment) and have significantly internationalized their operations. Tables 1 and 2 below present the relevant basic data on the two case-study companies and compare them with some other emerging-market players (see also Appendix 1 and 2 for historical revenues).

Table 1: Basic data on the two case-study companies

	<i>Asseco Group</i>	<i>Comarch Group</i>
<i>Year established</i>	1991	1993
<i>Sectoral specialization</i>	Enterprise software and services	Enterprise software and services
<i>Worldwide employment 2016</i>	ca. 22,000	ca. 5,300
<i>Consolidated revenue 2016</i>	7.93 billion PLN (1.82 billion EUR)	1.11 billion PLN (255.7 million EUR)

Note: revenues in Polish złoty (PLN) and euro (EUR), based on the 2016 average exchange rate (ECB, 2018)

Sources: Asseco (2017a), Comarch (2017b)

In the empirical analysis, I will pursue *a twofold goal*. *First*, I will attempt to historically reconstruct the corporate strategies of the two companies since the early 1990s. In doing so, I will focus on describing the firms’ interrelated practices regarding: (1) *sales market operations*, by which I mean the activities

⁴ For the purpose of the present study, I will refer to this specialization within the IT sector as “enterprise IT” or “EIT.” I will provide a more detailed description of this subsector in Section 3.

aimed at developing and maintaining client relations in the targeted product or services markets; (2) *corporate finance*, that is, the specific manner in which the firms acquire financial capital; and finally (3) *productive organization*, which refers to the scope and kinds of value-chain activities performed in-house—as distinct from the inputs acquired externally. And *second*, when historically reconstructing the firms' trajectories, I will attempt to find out which institutional structures, both *domestic* and *transnational*, have influenced their strategies and in what way.

Table 2: Case-study companies compared with other emerging-market software producers

Rank	Company	HQ Country	Software revenue (2014)	Total revenue (2014)	Software as % of total revenue
1	Kaspersky Lab	Russia	\$695 m	\$711 m	98%
2	TOTVS	Brazil	\$584 m	\$752 m	78%
3	Neusoft	China	\$508 m	\$743 m	68%
...
13	Asseco	Poland	\$126 m	\$1,973 m	6%
...
19	Comarch	Poland	\$88 m	\$329 m	27%

Notes: all revenues in millions (m) of US dollars

Source: PwC (2016)

1.3. Methods and overview of the analysis

The empirical analysis will use the *qualitative case study* method, which is generally recommended for studies dealing with complex variables (D. Byrne, 2009; De Vaus, 2003). By focusing on small numbers of cases and investigating them extensively, researchers using case study methods are able to develop in-depth and context-sensitive explanations (De Vaus, 2003). At the same time, my analysis will utilize a *double case study* design focusing on two firms—which should allow me to control for idiosyncrasies arising from company-specific paths and reveal regularities regarding the relationship between the studied corporate strategies and their institutional contexts.

In order to answer my research questions, I have gathered rich *archival data* documenting the firms' historical development between the early 1990s (when both of them were founded) and late 2017 (when the data collection period ended). The collected dataset comprises over 6,500 documents on Asseco and over 2,700 on Comarch—with the imbalance in the number of documents resulting from Asseco's much more complex history, which included several large mergers and acquisitions, both in Poland and abroad. When collecting the data, I have consulted the following key sources: (1) various kinds of *company data*, like current and annual reports; (2) *media coverage*, including both trade press and mainstream sources; and (3) *scholarly articles*, including rare literature on the two companies (e.g., analyses of their software products). By using the data from these different sources and representing different viewpoints (e.g., trade press articles, scholarly analyses, and company documents), I was able to increase the validity of my analysis (*triangulation*). In addition to the data on the two firms, I have also gathered diverse empirical material (e.g., statistical data and scholarly analyses) describing the national-institutional and sectoral contexts within which Asseco and Comarch have operated. In general, because systematic data on the analyzed phenomena could not always be collected, the presented analysis will be exploratory in character.

Regarding *data analysis*, I followed three steps. *First*, I used the collected empirical material to reconstruct the general developmental trajectories of the two firms between the early 1990s and mid-2017. In doing so, I synthesized data from multiple sources and sorted it into categories corresponding to the three main dimensions of the studied business models: *sales market operations*, *corporate finance*, and *productive organization*. The *second* step was more theory-driven and guided by detailed hypotheses

about the possible influence of the sectoral and national institutional contexts on the firms' corporate strategies (presented in Sections 3 and 4). In the *third* and final step, my goal was to identify *cross-case similarities* regarding the relationship between the firms' business models and the relevant institutional factors.

The remainder of the paper is organized as follows. In the next section, I will develop a more specific theoretical framework for the analysis by drawing on two perspectives on how firms develop competitive strategies in institutional contexts: *first*, the "varieties of capitalism" (VoC) tradition, and *second*, the theory of sectoral systems of innovation and production (SSIP). In Sections 3 and 4, building mostly on the research literature and statistical data, I will attempt to put some "empirical flesh" on the bones of the theoretical model. The main focus of the third section will be the ongoing process of "modularization" in the EIT sector and its possible implications for the business models of "latecomer" firms like Asseco and Comarch. Following this, the fourth section will discuss the potential "fit" between the Polish national-institutional framework and the hypothetical corporate strategies of companies operating in the EIT industry. The analysis will show that some aspects of the country's political economy—like the relatively well functioning stock exchange or some country-specific segments in the sales market—may, indeed, be conducive to the growth of an indigenous EIT sector. The empirical analysis of the corporate strategies developed by Asseco and Comarch will be presented in Section 5. The final part of the paper will summarize the observations regarding the two studied business models and propose some broader conclusions. On the most general level, the findings contribute to the discussions on the catching-up processes in emerging countries by, *first*, indicating the developmental potential related to modularization processes in high-tech industries, and *second*, focusing attention on how such modularized production systems intersect with country-specific institutional frameworks.

2. Theoretical approach

2.1. A multilevel perspective

My general hypothesis in the following analysis will be that in order to explain the successful development of the two Polish EIT firms, we need to focus on the *interplay* between the home-country institutions and the changing industry structure of the transnational EIT sector. By focusing on these two kinds of institutional variables, the present study responds to numerous recent calls for a greater recognition of the "competing impact of different levels of governance" (Lane & Wood, 2009) on firm behavior (see also e.g. Bluhm, 2010; Cusmano, Morrison, & Rabellotti, 2010; Plank & Staritz, 2015; Teipen, 2016).

2.2. The role of national-institutional frameworks

My conceptualization of the national-institutional aspect draws on the varieties of capitalism theory developed by Hall and Soskice (2001). Seen from this perspective, the institutional frameworks of national political economies—for instance, country-specific labor market regulations, education systems, or financial institutions—create, in a more or less complementary way, specific sets of resources that business enterprises are likely to exploit when developing their corporate strategies. The original VoC theory (Hall & Soskice, 2001) centered on an ideal-typical distinction between two major capitalist "varieties," producing distinct modes of firm behavior. While the highly regulated institutional frameworks of the "coordinated market economies" (e.g., Germany) were thought to foster corporate strategies based on interactor coordination (e.g. regarding training programs), the more

“fluid” labor and capital markets characteristic of the “liberal market economies” (e.g., the USA) were said to incentivize more dynamic, radical-innovation-oriented business models.

However, while my analysis will generally acknowledge the influence of national institutional frameworks on corporate strategies, I will also take two important points raised in the critical discussions around the VoC concept into consideration. *First*, there is the question of *firm agency*—which was partly addressed by the authors of the theory themselves (see e.g. Casper & Soskice, 2004). Numerous commentators emphasized that company-level practices cannot simply be “read off” from the characteristics of the country-level institutional arrangements and that firms are usually able to take various *entrepreneurial measures* in order to develop business models unsupported by a given national framework. As specified by Herrmann (2008), besides simply pursuing “atypical” practices within their national contexts, firms may also follow an *internationalization* path and develop business models based on foreign institutional resources—either by relocating their own operations or by importing the needed resources (e.g., labor or finance).

The *second* widely recognized problem with the original VoC perspective is that the theory disregarded the *internal complexity and heterogeneity* of national-institutional settings. One of the central arguments proposed by Hall and Soskice (2001) was that advanced capitalist economies like Germany or the USA have developed country-specific and enduring modes of economic coordination grounded in their highly coherent institutional frameworks. Countering this claim, several commentators have suggested that even in the most developed Western economies, national-institutional environments are internally diverse and able to support dissimilar “capitalist” logics (Lange, 2009; Schneiberg, 2007). As pointed out by Lange (2009), this within-country heterogeneity provides business enterprises considerable leeway in developing their business models.

2.3. *The influence of transnational sectoral governance*

At the same time, when explaining the successful development of homegrown Polish EIT firms, I will build on the general suggestion in the existing literature that in addition to country-specific factors, *sectoral factors* also shape corporate strategies. This perspective has been developed by Malerba (2002) among others under the label of *sectoral systems of innovation and production*. The author proposed understanding the characteristics of firms’ productive strategies as being shaped by the three sector-specific organizational structures: (1) *technological regimes*, (2) *formal regulations* (like technological standards or governmental industrial policies), and (3) *relations with other industrial actors* involved in the sectoral innovation, production, or commercialization processes.

Building on the original formulation of the concept, other authors have recently advanced SSIP theory. These authors—who refer partly to the global-value-chains perspective (Gereffi et al., 2005)—have argued that sector-specific coordination frameworks should be analyzed at a transnational level so that actors located within multiple national contexts are included (see e.g. Cusmano et al., 2010; Fuenfschilling & Binz, 2018). One empirical study applying such a transnational-sectoral view is a study by Brandt and Thun (2011). This work, which focused on the Chinese case, showed how a globally changing production regime in the mobile handset sector—and more specifically, the industry’s shift from integral to modular product architectures—lowered the technological barriers for companies to enter into independent production and thereby created new growth opportunities for emerging-country players.

2.4. *Research questions*

Drawing on the two theoretical perspectives, the present study will analyze the historical operations of the two companies, Asseco and Comarch, as organizations embedded in both national and industry-specific institutional contexts. *First*, building on VoC theory, I will attempt to determine which within-

country institutions have shaped the firms' corporate strategies and in what way. *Second*, in the following analysis, I will refer to the SSIP perspective and attempt to find out the possible influence of the transnational industry structures characteristic of the EIT sector on the corporate strategies.

3. Governance structure of the transnational enterprise IT sector

3.1. Technological and organizational change in the EIT sector

In this section, I will attempt to reconstruct the main relevant characteristics of the sectoral production regime of the global EIT industry⁵. Around when the two companies started developing their operations (i.e., in the decade after the mid-1980s), the industry underwent a fundamental technological and organizational shift. This was linked to a more general shift across the entire IT sector, which moved from a vertically integrated mode of production towards a more fragmented, vertically specialized one (see e.g. Borrus & Zysman, 1997; Hart & Kim, 2002; Lazonick, 2009; Lüthje, 2004; Macher & Mowery, 2004). As Borrus and Zysman (1997) have shown using the example of the personal computer (PC) industry, in the mid-1980s, a new model of industrial governance characterized by loose cooperation and, at the same time, intense competition between highly specialized component suppliers emerged in the IT sector. Although it originally developed in the US context, this new paradigm has had a profound impact on the way IT production has been organized globally.

Let us now take a closer look at the historical transformation that has taken place within the EIT sector. In its early days, the industry was dominated by a small number of large companies of a "Chandlerian" type, which produced and delivered complete, integral enterprise information systems to their clients (Chandler, 2005). The most typical example of this historical productive model was the American giant IBM (see e.g. Borrus & Zysman, 1997; Campbell-Kelly, 2004; Hart & Kim, 2002; Yost, 2017). Until the mid-1980s, the firm produced mostly "closed," proprietary IT systems with hardware and software components that only worked with the company's own system architectures and interfaces. Moreover, as an IT services provider, IBM focused exclusively on installing and maintaining its own proprietary solutions (see Gerstner, 2002).

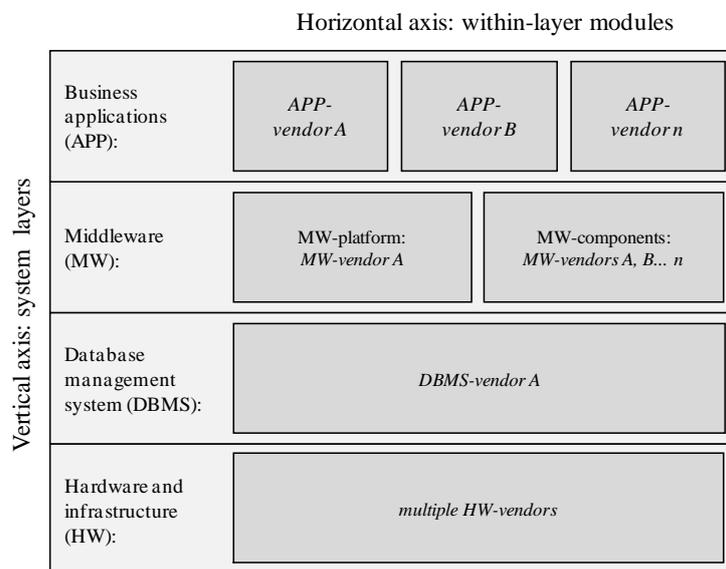
However, the dominance of the vertically integrated industrial paradigm exemplified by IBM's business model quickly eroded in the mid-1980s (Mowery, 2009). This resulted from two closely related developments. *First*, with the advent of technologies such as PCs, client-server architectures, and "open" operating systems (e.g. UNIX), the sector suddenly shifted from integral product architectures towards more modular ones. Enterprise IT solutions, which had hitherto been constructed as internally complex, tightly coupled systems, were divided into functionally autonomous sub-units that communicated with each other via various more or less standardized interfaces. An important implication of this was that such functionally specialized modules could—in principle—be designed and produced separately by a number of independent companies (see e.g. Langlois, 2003). And *second*, originally in the US context, a number of highly specialized and (initially) rather small EIT companies quickly emerged—like Oracle and Informix for software, or Cisco for hardware. These companies adopted leading positions in the emerging product markets for the modularized components of enterprise information systems. The rapid growth of such "specialist" suppliers put giant incumbent firms like IBM under enormous

⁵ Using the NAICS categories, the sectoral specialization of the two firms would encompass the following two types of activity: (1) NAICS 5112: "software publishers", and (2) NAICS 54151: "computer systems design and related services" (see NAICS, 2017a; NAICS, 2017b). The third general category belonging to the EIT value chain would be the production of enterprise hardware like data-center servers, large-scale storage systems, or enterprise network equipment by companies like Hewlett-Packard, Dell, or Cisco.

pressure, forcing the latter to eventually abandon their vertically integrated business models (Lazonick, 2006).

One general consequence of the technological and organizational changes since the mid-1980s is that nowadays enterprise information systems are no longer *single-vendor solutions*, but *multivendor* ones (Davies, Brady, & Hobday, 2007). The dissemination of largely standardized—and in many cases “open”—interfaces within the industry has allowed various specialized producers to independently contribute to the final “product.” As suggested by Figure 1, we may generally identify two dimensions according to which the EIT systems have modularized. *First*, on the *vertical* axis, we can see various system layers, and most generally: *hardware*, comprising all the physical devices; and several *software* layers. With respect to the software layers, database-management systems (DBMS, enabling users’ interactions with relevant databases) and middleware (integrating separate system layers and various otherwise incompatible applications) are regarded as infrastructural elements, while business applications—i.e., tools to manage various enterprise processes (like manufacturing, order processing, or HR)—represent the higher-level system strata. As far as the specialist suppliers’ product market strategies are concerned, during the decade or so after the shift to the multivendor system architectures, the dominant tendency among the software firms was to develop products for a single layer of the modularized system. For instance, the US company Oracle focused on producing database-management systems, while the German company SAP specialized in higher-level business applications. Today, however, the leading specialist software firms usually provide products for several system layers (see e.g. Campbell-Kelly & Garcia-Swartz, 2010 on the growing competition between SAP and Oracle in the business-applications segment).

Figure 1: Schematic modular structure of an enterprise IT system



Source: author based on Fan, Stallaert, and Whinston (2000); Kude and Dibbern (2009); Kumar, Esteves, and Bendoly (2011)

Second, as shown in Figure 1, there is a *horizontal* dimension of modularization that takes place within specific strata of the EIT architecture. While this is already a well-established phenomenon at the level of hardware, it is a more recent development within the software layers of the EIT systems. As suggested by Kude and Dibbern (2009), the emergence of advanced middleware solutions and “service-oriented architectures” (since the late 1990s or so) has been necessary to enable a smooth integration of multivendor business applications. Using such technologies, various software components that were

previously delivered as integral products—for instance, ERP⁶ applications—are now divided into smaller and more easily customizable modules. One of the main advantages of such horizontal fragmentation is that the “modular” applications can be produced by more specialized software companies (Kude & Dibbern, 2009).

3.2. *New “windows of opportunity” for emerging-country players*

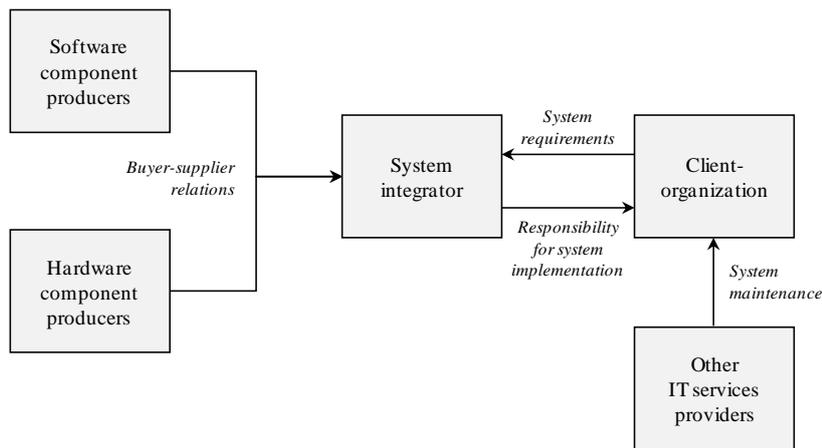
Drawing on these general observations regarding the ongoing modularization processes within the EIT sector, I will now discuss the possible implications of this industrial transformation for companies like Asseco and Comarch, which are latecomers in the sector and specialize in the provision of enterprise software and related IT services. *First*, regarding the services segment—which is often perceived as the main entry pathway into the IT sector for emerging-country players (Schware, 1987)—vertical specialization within the EIT industry has created an increased demand for postproduction integrative services. This is because, while standardized interfaces have largely enabled component interoperability, they have nevertheless not reduced *the complexity of the final product* (i.e., the EIT systems). Before being put to use by a given client organization, these systems have to be assembled from numerous parts into a well-functioning whole. In this regard, Dosi, Hobday, Marengo, and Prencipe (2005) pointed out that the modularization of products and productive activities in the enterprise IT sector⁷ has created a market demand for the “integrative knowledge” necessary to “master interfaces and compatibilities across different components” (Dosi et al., 2005, p. 109). And while “system integrators” (that is, companies specializing in the implementation of large IT systems rather than in the production of hardware or software; see Figure 2) did already exist in the EIT industry before its shift to multivendor solutions (Yost, 2017), the modularization processes have made their work more complex, more independent of proprietary system architectures, and, therefore, more value-adding.

And *second*, there is an important consequence of the modularization processes within the global EIT sector for latecomer firms regarding the production of enterprise software. This is related to the emergence of a specific, platform-based logic of cooperation and competition in the industry. In the old, vertically integrated paradigm, large companies like IBM used to employ proprietary, “closed” interfaces when producing their software and hardware components in order to prevent their products from being interoperable with those developed by competitors (Borrus & Zysman, 1997). In the contemporary, vertically specialized EIT sector, a different approach to interfaces and standards is clearly evident among key software-component firms like database or ERP producers. In general, their competitive strategies focus on ensuring a widespread adoption of the “core technologies” they produce among various downstream developers. By doing so, the key software suppliers hope to turn their proprietary solutions into “platforms” (Gawer & Cusumano, 2014) that are accepted as “de facto standards” (Borrus & Zysman, 1997) within the sector. And in order to achieve this goal, the leading companies have adopted the policy of “open-but-owned” interfaces (Borrus & Zysman, 1997), which involves disclosing the technical specifications of their proprietary solutions to a large number of independent software producers. From the perspective of latecomer firms, a key implication of this specific logic of cooperation and competition in the EIT sector is that now they may create their own “modular” software products that build on state-of-the-art platform technologies provided by external suppliers.

⁶ ERP stands for “Enterprise Resource Planning” and refers to business applications supporting various organizational operations like HR, production planning, sales, or distribution.

⁷ The authors refer to the enterprise IT sector as an industry specializing in the development of “corporate IT networks”.

Figure 2: Schematic relations between the integrators and other EIT value-chain actors



Source: author, loosely based on Kashibe (2006)

One example of a platform-based productive strategy developed by an emerging-country firm was the strategy developed by Indian software company i-flex Solutions, a company operating in the technologically demanding segment of financial sector applications. The company's surprising global success in this industry was based on a number of factors—including the firm's close ties to the multinational financial giant Citigroup or its initial focus on clients from less contested, emerging markets. But its success as a *producer* of financial IT solutions was most directly related to its close collaborations with several American suppliers of infrastructural software technologies like Oracle, Microsoft, or IBM. As Baba and Tschang (2004) point out, i-flex's competitive financial IT solutions were in fact higher-level business applications based on database-management systems provided by Oracle.

4. Institutional framework of the Polish enterprise IT industry

4.1. A sector-in-country perspective

I will now discuss in more detail the relevant characteristics of the Polish national-institutional framework. In the following, I will apply a *sector-in-country perspective* (Donnelly, Grimshaw, & Miozzo, 2011) in order to determine how conducive the country's institutions may have been to the development of an indigenous enterprise IT industry.

The analysis will be structured around the three main dimensions of firms' corporate strategies mentioned in the introductory part of the paper: (1) corporate finance, (2) the productive organization, and (3) the sales market operations. Regarding the *first* dimension, I will ask what suitable forms of external finance were available for entrepreneurially oriented firms within the Polish financial system. For the *second* dimension, I will analyze the within-country supply of productive resources that domestically operating EIT firms may have relied on when developing their industry-specific in-house technological capabilities. By "technological capabilities," I understand the range of productive tasks that business enterprises are able to undertake on their own (see Heeks & Grundey, 2004). And finally, *third*, concerning the sales market operations, I will investigate to what extent the characteristics of domestic demand for EIT products and services may have made the Polish sales market a suitable environment for the development of indigenous firms.

In the following, I will describe these *three institutional contexts* in order of their increasing sectoral specificity—starting with the financial system (Section 4.2), through the public supply of adequately skilled labor and support for firms' R&D activities (4.3), to the characteristics of the domestic EIT sales market (4.4). In all three parts of the analysis, I will build on various theoretical assumptions

regarding the specific institutional preferences of entrepreneurial homegrown EIT firms—including, but not limited to, the suggestions derived from VoC theory.

4.2. *Institutions of the financial system*

Access to external funding is a crucial issue for EIT firms who want to develop by upgrading their productive capabilities, bringing new products to the market, or expanding internationally—to name just a few possible entrepreneurial growth strategies. Recognizing that IT industries are vulnerable to disruptive changes in dominant technologies, VoC theory has suggested that the optimal institutional environment for IT firm development should include fluid *stock and private equity markets* able to supply risk-tolerant capital (Vitols & Engelhardt, 2005). In addition, VoC theory has argued that because of their focus on long-term and more secure investments, bank-based financial systems (which are typical for developed Western European countries like Germany or France) will be a less optimal environment for IT industries (Casper & Soskice, 2004).

How conducive is the Polish institutional environment for the development of indigenous entrepreneurial IT companies—given their preference for market-based, risk-tolerant finance? According to the theory of “dependent market economies” (Nölke & Vliegenthart, 2009), the Polish financial system should not be in a position to provide much relevant support. As Nölke and Vliegenthart (2009) have suggested, a central characteristic of the Central European DMEs is their reliance on the financial capital supplied by *foreign-owned banks*. In the case of the Polish financial system, the foreign share of total assets of the country’s commercial banks, which had risen dramatically from about 17 percent in 1998, oscillated between 60 and 70 percent between 2000 and 2014 (NBP, 2016)⁸. The aspect that should make this foreign-controlled banking system particularly unsupportive of the development of home-grown entrepreneurial EIT companies is the fact that, as observed by Martin (2013), locally operating foreign banks have focused their lending mostly on MNCs, and not on indigenous industries.

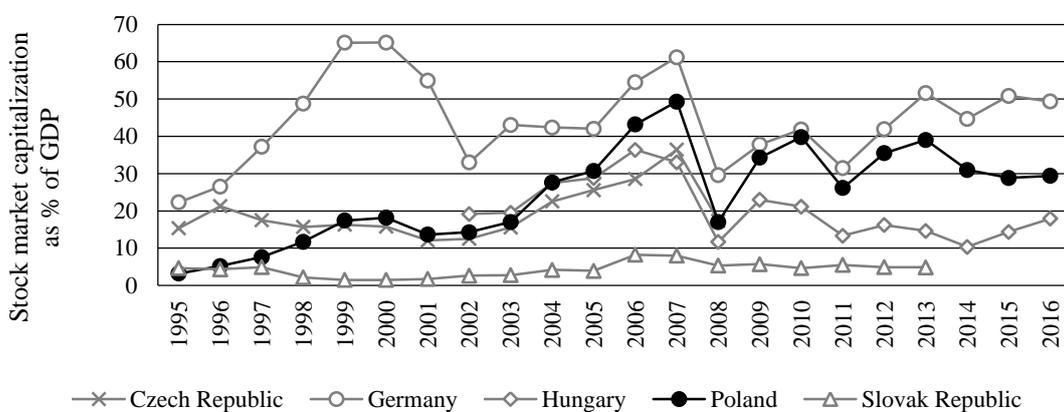
However, the Polish financial landscape is, in fact, more heterogeneous than the DME concept suggests. And most importantly, from the perspective of the indigenous IT firms, apart from the largely foreign-controlled banking sector, the country also has a relatively well-developed *capital market* that may be able to supply the required risk-tolerant finance (see e.g. Martin, 2013). One general indication pointing to this is that, in 2017, an established global benchmark provider, FTSE Russell, reclassified Poland’s stock market from “emerging” to “developed”—the first such case in postcommunist Central Europe (FTSE, 2017). Furthermore, additional support for this thesis emerges when we consider the historical development of Poland’s stock and private equity markets in regional comparison. The Warsaw Stock Exchange (WSE), the key institution of the Polish capital market, has grown dynamically since its launch in 1991 and become the largest stock market in postcommunist Central Europe, both in relative and absolute terms (Figure 3). In the early 1990s, WSE’s development was boosted by the government’s privatization policy, which used stock trading as one of the main mechanisms of ownership transfer to nonstate investors (Tamowicz, 2006). Since 1999, investments made by domestic private pension funds had a similarly stimulating influence on WSE’s growth—these funds were legally obligated to invest 40 percent of contributions in WSE-listed companies (Wilinski, 2012). And second, regarding private equity funding⁹, the market started developing in Poland as early as 1989, initially due to the activities of various foreign actors. For instance, the first private equity fund established in

⁸ Most recently, the foreign share of total bank assets in Poland fell below 50 percent as a result of a state-led takeover of the country’s second largest bank by domestic investors in 2017 (ITA, 2017).

⁹ By private equity funding, I mean various forms of medium- to long-term finance (including venture capital) provided by external investors in exchange for a stake in a hitherto unquoted company (Arnold, 2010).

Poland was sponsored by the Danish government, and the second one had US Congress support (Kalinowska-Beszczynska, 2013). Looking at the contemporary Polish private equity sector, we see that although foreign capital has generally remained dominant, more recently, the share of domestic investors has slightly increased—reaching about 13 percent in 2009 (Kalinowska-Beszczynska, 2013). And regarding the overall market size, the country’s private equity industry is currently the largest in postcommunist Central Europe (Dunin-Wąsowicz & Pradelle, 2014; Klonowski, 2011; Martin, 2013). At the same time, both the stock and the private equity markets in Poland remain small when compared with those in the most advanced capitalist economies—the ratios of stock capitalization and private equity investment to GDP are comparable to, but lower than those observed in Germany, a traditional bank-based economy (Figures 3 and 4).

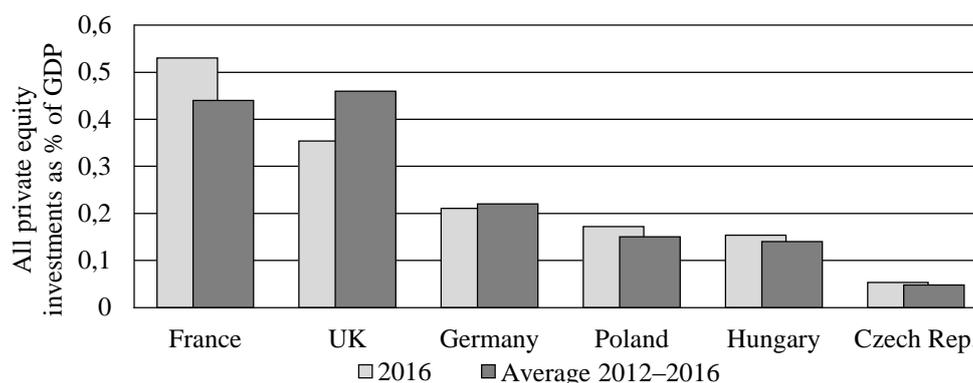
Figure 3: Stock market capitalization of listed domestic companies as percentage of GDP in Poland and selected countries



Source: World Bank (2017)

From the microlevel perspective of the business enterprises, however, the mere presence and size of a capital market in a given country is not the crucial point; regulations regarding, for instance, the firms’ market-entry or corporate governance are also vitally important. In this respect, the Warsaw stock exchange’s institutional design seems to produce both some potential advantages and disadvantages for emerging entrepreneurial companies. *First*, the WSE’s quite stringent disclosure standards (Bluhm, 2007)—e.g., the requirement to publish quarterly reports—may be seen as a “beneficial constraint” (Streck, 1997), which, while imposing an obvious burden on firms, may increase investors’ trust in the market. *Second*, the WSE’s code of conduct follows a “comply or explain” approach (Martin, 2013), which sets clear corporate governance standards, but leaves the firms some important leeway regarding their actual behavior. A perhaps more problematic issue relates, *third*, to regulations on shareholder power, which allow a differential weighting of shares (Federowicz, 2003; Martin, 2013). While these regulations give listed firms the possibility to combine equity financing with concentrated strategic control, the presence of unequal power structures within a listed company may discourage involvement by external investors. And finally, *fourth*—and perhaps most unfavorably for emerging entrepreneurial companies—the WSE has relatively stringent listing requirements, which may represent a serious entry barrier for young firms (Köke & Schröder, 2002; Stringham, Boettke, & Clark, 2008). In order to mitigate this negative effect, various “secondary” floors with lower requirements have been created in Warsaw (Klonowski, 2011)—like the “parallel market” or the “free market” (until 2001).

Figure 4: Total private equity investments as percentage of GDP in Poland and selected countries (considering location of the portfolio company)



Source: Invest Europe (2017)

4.3. The development of technological capabilities

In this section, I will analyze the institutional support on which EIT companies operating in Poland can rely when developing their technological in-house capabilities. In doing so, I will build on the following assumptions regarding the relevant characteristics of an optimal national-institutional framework. *First*, I will assume that because both IT services and the production of enterprise software are *skill-intensive* activities (Berrebi-Hoffmann, Grimshaw, Lallement, & Miozzo, 2010; Rouseva, 2010), the growth of the EIT sector will depend on the presence of an academic education system able to supply a sufficient number of *tertiary graduates in computer sciences*. In addition, as suggested by the VoC theory (Casper & Soskice, 2004), *flexible labor market regulations* allowing firms to adapt their human capital strategies to technological change will be beneficial for the companies (although disadvantageous for the employees). And *second*—related to enterprise-software production—I will assume that, as firms involved in knowledge-intensive activities, EIT companies require a significant *R&D input* to achieve their commercial goals (Kozul-Wright & Howells, 2002; Mowery, 1999). For this reason, I assume that EIT sector development will benefit from the availability of extramural R&D support, either directly from the state (e.g., in the form of financial subsidies) or from various public research institutions (e.g., in the form of external knowledge inputs).

Given these two general assumptions, what kind of relevant support can EIT companies operating in Poland rely on? First, regarding the *external provision of R&D inputs*, the existing literature suggests that the country's innovation system suffered a major crisis after the transition to capitalism—and has not yet entirely recovered (Hardy, 2007; Jasiński, 2013; Martin, 2013). One possible indicator of this can be found in the data on *gross R&D expenditure*. For instance, in 2001, total spending on R&D in Poland was at 0.6 percent of GDP—which was low even in comparison with the other postcommunist economies (Hungary: 0.9%, the Czech Republic: 1.1%; see: OECD, 2017b)¹⁰. The gap between spending in Poland and in more advanced countries was, of course, much larger¹¹. The picture only slightly improves if we consider indicators more directly reflecting the *availability* of extramural public R&D support to firms. For instance, the data on the *public R&D spending* between 2007–2011 quoted by Jasiński (2013)¹² suggest that Poland (with 0.53% of GDP) also lagged behind the Czech Republic (0.72%) in this respect—although, admittedly, the country already scored higher than Hungary and Slovakia

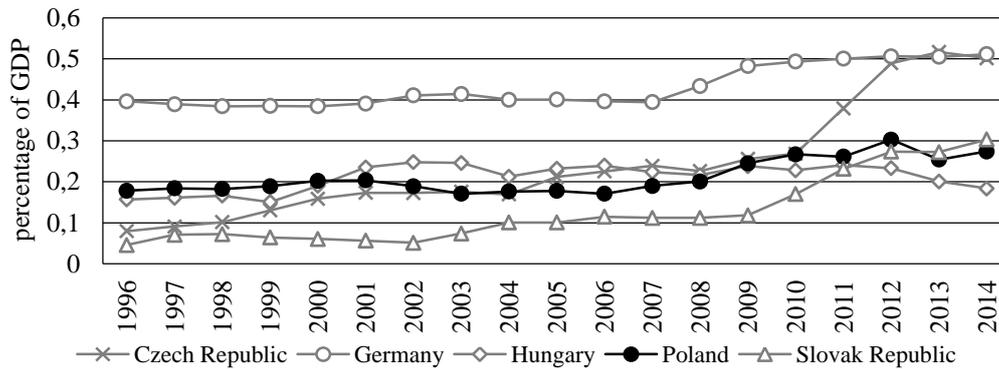
¹⁰ In Slovakia, R&D expenditure after 1989 was comparable to, but usually lower than in Poland.

¹¹ For instance, between 2000–2015, the average German gross R&D expenditure was 2.6% of GDP (OECD, 2017b).

¹² The author relied on the European Commission's annual European Innovation Scoreboard.

(both 0.43%). At the same time, also regarding this second variable, the gap between Poland and the most advanced economies (e.g., Germany, with 0.94%) was significant. A similar situation prevails when we consider the data on the R&D activities conducted by national *academic institutions* (Figure 5). According to OECD (see UIS, 2017), the total value of the R&D performed at Polish universities in years 1996–2014 oscillated between 0.2 and 0.3 percent of GDP. This was comparable to the levels observed in other Central European countries¹³—but was, again, much lower than those of most advanced economies. For instance, in 2014, German universities performed R&D activities worth about 0.5 percent of the country’s GDP. In sum, considering both the existing literature and the statistical data, we may generally expect that the public innovation system in Poland has not provided strong support for the indigenous firms operating in the EIT sector.

Figure 5: R&D activities performed by higher education as a percentage of GDP

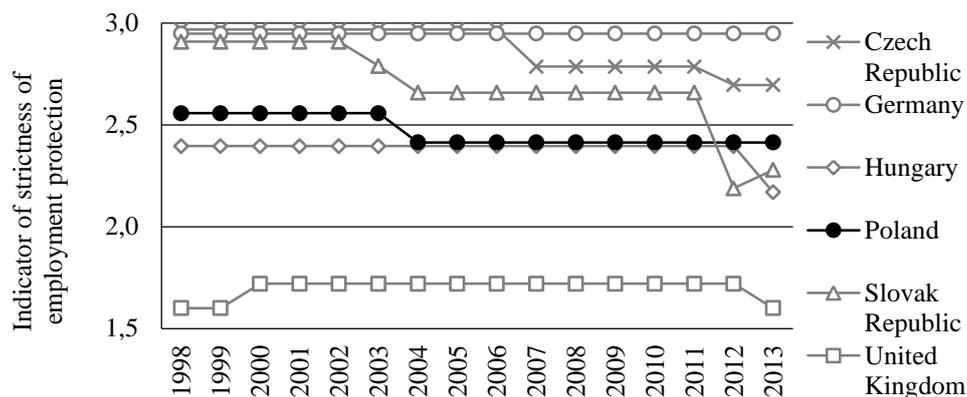


Source: UIS (2017)

At the same time, the Polish institutional framework seems to offer locally operating EIT firms various advantages regarding their human-capital strategies. *First*, with respect to the labor-market regime, local regulations are rather flexible and grant employers considerable leeway regarding their hiring and firing decisions. In general, the existing literature suggests that a transformation towards a more “liberal” model of employment relations has recently taken place in the country (Jasiecki, 2017). This is indicated, for instance, by the massive expansion of limited-term work contracts since the early 2000s (Trappmann, 2011), the weakening political influence of trade unions on industrial relations (Gardawski, Mrozowski, & Czarzasty, 2012), or the dramatically falling unionization rates after 1989 (Krzywdzinski, 2010). And perhaps most directly relevant from the perspective of the high-tech firms’ rapidly changing human-capital strategies, the stylized OECD (2017c) data suggests that the strictness of employment protection in Poland has clearly decreased since the late 1990s—reflecting a more general trend in the Visegrád countries (Figure 6).

¹³ With the exception of the Czech Republic since 2011 (see Figure 7).

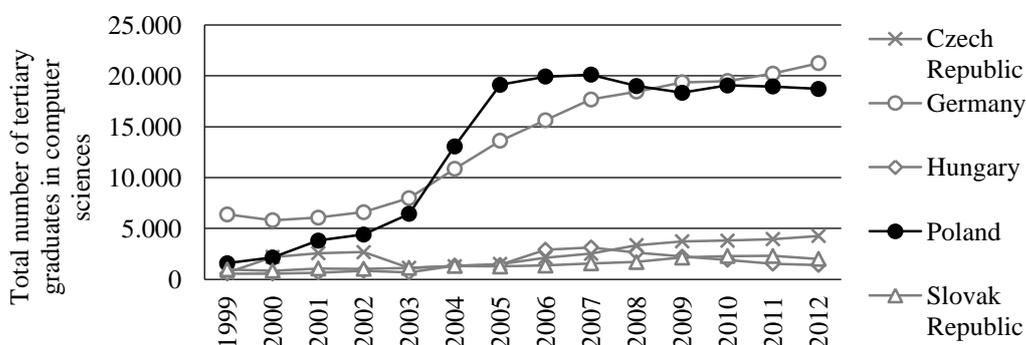
Figure 6: Strictness of employment protection in Poland and selected countries (individual and collective dismissals, regular contracts)



Source: OECD (2017c)

And second, regarding the supply of a high-skilled workforce, the EIT firms operating in Poland should be able to benefit from a large availability of tertiary graduates in computer sciences. This characteristic of the country's institutional environment is related to a broader transformation of its skill-formation system after 1989: a dramatic expansion of academic education occurred at the expense of vocational training (Kogan, Gebel, & Noelke, 2013). Statistical data indicate that the share of the Polish population aged between 25 and 34 with tertiary qualifications almost tripled between 1995 and 2016, rising from 14.6 to 43.5 percent (OECD, 2017d). And interestingly, this development was much stronger in Poland than in other countries in the region, where the share of tertiary graduates reached slightly over 30 percent in 2016 (Czech Republic: 32.6%, Hungary: 30.4%, Slovak Republic: 33.4%; and Germany: 30.5%). And most importantly for the present analysis, this dramatic expansion of academic education was also reflected in the number of graduates in computer sciences, who constitute the "talent pool" for locally operating EIT companies. As shown in Figure 7, the absolute numbers of IT graduates per year in Poland was comparable to and periodically even higher than in Germany, a country with an overall population that is twice the size. Moreover, the number of Polish tertiary graduates in computer sciences also remains high in relative terms compared to the region's other economies. For instance, in 2012, there were about 492 computer science graduates per million inhabitants in Poland compared to 406 in Czechia and 141 in Hungary¹⁴.

Figure 7: Tertiary graduates in computing (ISC 48) in Poland and selected countries



Source: OECD (2017a)

¹⁴ As calculated by dividing the total number of tertiary graduates in computer sciences (OECD, 2017a) by the countries' overall populations (in millions, with two decimal places) in 2012. For Germany the ratio is: 264.

4.4. The domestic EIT market

In this final part of the sector-in-country analysis, I will explore the characteristics of *the domestic market for EIT products and services* in Poland in order to find out to what extent the market might have created a suitable environment for the development of indigenous firms. The existing literature has generally suggested that local sales markets played an important role for the development of the IT industries. For instance, Kenney (2017) has generally argued that the phenomenal growth of many Silicon Valley start-ups was related to the considerable demand for high-quality products and services in the US market. According to Nakagawa (2001), the global success of the German ERP vendor SAP was facilitated by an extensive base of large and demanding organizational clients in its home country. Focusing on Brazil, Botelho, Stefanuto, and Veloso (2005) explained the relatively successful growth of the country's indigenous software and IT services sector by pointing to the role of sophisticated domestic IT-system buyers—primarily in the Brazilian financial and telecoms industries. Complementing these arguments, D'Costa (2002) observed that the absence of high-quality domestic demand might have negatively influenced the trajectories of the Indian IT giants by locking them into the path of “dependent,” export-oriented, and noninnovative growth.

The existing literature has also suggested that in order to understand how the domestic market may become a “stepping stone” for homegrown companies, we also need to consider the regulations governing the entry of foreign and potentially more competitive players. Gentle and Howells (1994) observed that the emergence of EIT industries in several West European countries (e.g., in France) was related to various country-specific characteristics of national markets, which advantaged indigenous over foreign firms. Apart from mere market size, the factors include: large domestic clients' *procurement policies* (e.g., those of governmental organizations), *language barriers* that created a demand for country-specific solutions, or *distinct technological standards*, often supported by local hardware producers (Gentle, 1996; Gentle & Howells, 1994). And although Gentle and Howells (1994) emphasized that such national barriers have substantially eroded since the early 1990s, empirical research provides examples of how they may, indeed, “protect” indigenous IT sectors today, too. For instance, in their analysis of the domestic IT sectors in Russia and China, Heeks and Nicholson (2004) observed that these sectors' relatively successful development was greatly facilitated by the countries' growing sales markets, which were difficult for foreign vendors to penetrate. As the authors emphasized, the “local laws, local customs and local languages” (Heeks & Nicholson, 2004) created serious entry barriers for MNCs.

In light of these two suggestions from the literature, did Poland's EIT market create favorable conditions for the development of homegrown companies? The first thing to note is the dramatic growth in demand for IT services and software in Poland since the early 1990s. According to the data quoted by Kubiela (2000), the value of the domestic market for “software services”¹⁵ increased twenty-fold between 1991 and 1995 alone due to—among other factors—the launch of several large-scale computerization projects in sectors like banking or public administration. Looking at more recent comparative data, we find that the Polish EIT market is the region's largest in absolute terms. For instance, for “project-based IT services”¹⁶ (EITO, 2013a), domestic turnover in Poland between 2010 and 2014 was, on average, almost twice as high as in the Czech Republic and about four times as high as in Hungary (Table 3). But at the same time, note that the country's sales market remains relatively small compared to the most advanced European economies like Germany or the UK.

¹⁵ We should note, however, that the data to which the author referred probably also included individual-user software, and not only enterprise software.

¹⁶ This statistical category was proposed by EITO (2013b) and includes three kind of activities: IT consulting, systems integration, and applications development. We must note, however, that the category covers only a fraction of the EIT market—it excludes, for instance, standard enterprise software.

Besides the mere demand volume, let us take a look at relevant formal and informal institutions governing MNC access to the Polish EIT market. Here, we need to take into account, *first*, the general regulatory changes in the country in the early postcommunist era, which greatly facilitated foreign market entry and FDI. One of the central assumptions of the “neoliberal” reform package introduced in the early 1990s (“shock therapy”) was that the country’s economy needed a sudden and radical opening to competition from abroad (Sachs & Lipton, 1990). And accordingly, all preexisting trade barriers and disincentives to FDI (e.g., limitations on the profit transfers abroad) were abolished or substantially reduced. *Second*, there was an international regulatory change more specifically affecting the local IT sector: a gradual lifting of the COCOM embargo¹⁷—a Cold War-era ban on high-tech exports from the West to communist countries (Heeks & Grundey, 2004; Lipton, Sachs, Fischer, & Kornai, 1990). And finally, a *third* important regulation facilitating the entry of foreign IT vendors was the government’s new procurement policy introduced in the early 1990s. Even in the first transformation years, Poland’s public sector had already shifted from “closed,” vendor-specific solutions (which could, theoretically, be developed on-demand by indigenous firms) to “open” systems, based on international standards (Computerworld, 1991)¹⁸. In this way, a technological barrier potentially inhibiting MNC entry into the country’s governmental organization segment disappeared.

Table 3: Total market value of project-based IT services in Poland and selected countries

	2010	2011	2012	2013*	2014*
<i>Czech Republic</i>	686	700	663	671	689
<i>Germany</i>	8,033	8,319	8,512	8,720	8,982
<i>Hungary</i>	271	264	272	280	292
<i>Poland</i>	1,065	1,084	1,219	1,257	1,310
<i>United Kingdom</i>	13,437	13,317	12,918	13,108	13,515

Notes: (1) data in million euro; (2) “project-based IT services” include: IT consulting, systems integration, and applications development. * Forecasts.

Source: EITO (2013a)

Due to these regulatory changes, foreign vendors were able to start developing their operations in Poland very soon after the country’s transition to capitalism. For instance, two of the leading global EIT firms, IBM and HP, opened subsidiaries in 1991 (UPI, 1991) and immediately became significant players on the local market. But at the same time, there are indications that MNC entry was not always trouble-free. Perhaps most significantly, some established foreign firms who wanted to operate as local system integrators encountered difficulties in working in the local context. The most notorious example of this was the French company Bull, which—arguably due to a failure to adapt to local regulations and organizational practices (Kubielas, 2000)—never managed to complete the prestigious task of implementing a centralized tax collection system for the Polish government. In order to avoid such hazards, many other MNCs operating in the country developed close collaborations with local integrators able to undertake downstream coordination early on (Kubielas, 2000, 2004). Another sign that foreign EIT firms encountered entry barriers is the weakness of their presence in several segments of the local market—for instance, in the emerging sector of new private banks or small and medium-sized private enterprises (SMEs) (Kubielas & Yegorov, 2000). In these and many similar sectors, the market entry of MNCs might have been complicated both by particular product expectations of the local clients (relating, for instance, to country-specific formal regulations) and by the fact that these

¹⁷ COCOM stands for: the Coordinating Committee for Multilateral Export Controls, which existed between 1949 and 1995 and gathered major “first-world” economies.

¹⁸ In other countries, governmental support for open-system-oriented IT procurement was often a more disputed topic—see e.g. Anchoydoguy (2000) on the Japanese case.

customers—as small or emerging players in a transition economy—required low-cost rather than state-of-the-art solutions.

5. Historical trajectories of the two case-study companies

5.1. Introduction

In the previous sections, I have reconstructed the sectoral and the home-country institutional contexts within which the two case-study companies, Asseco and Comarch, have operated. The analyses provide a basis to formulate some more specific expectations regarding the firms' historical development. Let me now recapitulate the main findings and specify the questions for the empirical study.

The *third section* developed two suggestions regarding the possible influence of the “modularization” processes taking place in the EIT sector on latecomer firms' business models. *First*, I have pointed out that the fragmentation of the industry's value chain has prompted an increased demand for integrative IT services—which is a segment regarded as an important entry path for emerging market players (Schware, 1987). The *second* suggestion was that the new competitive logics within the EIT industry, resulting from an ongoing modularization of system architectures, has effectively lowered the technological barriers for the entry of emerging-market software producers by enabling them to pursue platform-based production strategies. In the following, I will build on these insights and attempt to find out to what extent the EIT companies I studied have taken advantage of the two sectoral “windows of opportunity”.

In the *fourth section*, I described the general “fit” between the hypothetical requirements of entrepreneurial EIT companies and relevant characteristics of Poland's national-institutional framework. The analysis has revealed a rather mixed picture. *First*, I have suggested that the EIT firms operating in the country should be able to benefit from the presence of a relatively well-developed capital market. This finding is important since, as suggested by the VoC theory, equity financing is the type of external funding particularly suited to the IT sector. *Second*, the analysis has indicated that, when developing their in-house technological capabilities, the EIT companies operating in Poland have probably not received strong support from the country's public innovation system. Yet, I have also shown that such firms can take advantage of a large local pool of flexible and highly qualified labor¹⁹. And *third* and finally, the sector-in-country analysis has suggested that various institutional characteristics of the local sales market might have created niches within which indigenous EIT firms would be able to grow unexposed to competitive pressures from MNCs—for instance, in the new private banking or SME segments.

In the following, I will use the above-developed observations to guide my in-depth analysis of the two case-study companies' corporate strategies. In doing so, I will take the companies' operations within and beyond the Polish context into consideration. First, regarding *sales market strategies*, I will focus on the role played by the domestic market in general in the firms' development, and in particular, on the role of niches less accessible to MNCs. Second, regarding *corporate finance*, I will analyze the firms' reliance on various sources of external finance—principally, on equity and bank-based funding. And third, concerning the *productive organization*, the analysis will describe the range and organization of productive activities performed by the two firms in-house—as distinct from the productive inputs acquired externally.

¹⁹ Due to the limitations of the available empirical material, I will not be able to thoroughly discuss the actual employment practices of the studied firms. The topic will remain an open question for further investigation.

5.2. Sales market strategies

Regarding sales market strategies, my analysis of the archival data suggests that there are various segments of the domestic EIT market that are relatively difficult for MNCs to access. These segments, I find, have played an important role in the development of the two companies. Yet reliance on domestic “niches” was largely characteristic for the firms’ early trajectories; more recently, a clear tendency towards domestic diversification and internationalization has emerged.

5.2.1. The first case-study company

Let me first discuss the case of the Asseco Group. As I have mentioned above, the company has a quite complex trajectory, including several large mergers and acquisitions both in Poland and abroad. Asseco started operating in the early 1990s as COMP Rzeszów²⁰ and was initially active in the relatively underdeveloped, south-eastern region of the country. At the beginning, the company focused on developing information systems designed specifically for domestic cooperative banks. In the 1990s, this sector included mostly very small, provincial banks that were usually unable to implement state-of-the-art IT solutions due to financial constraints. For this reason, this market segment was relatively unattractive for foreign MNCs. But for an emerging local IT enterprise with little financial capital or relevant expertise, the niche presented a good opportunity to grow. As various historical accounts suggest (Asseco, 2011; Matys, 2014), the company often built on its managers’ pre-existing personal connections and was thus able to develop trust-based relations with the banks. At the beginning, when COMP still had limited competences in implementing financial IT solutions, the firm partly relied on the knowledge of the banks themselves, who helped the firm understand the main processes involved (Asseco, 2011; Hej Rzeszów, 2009). Over the years, COMP managed to develop a strong client base in the cooperative banking sector all over Poland. By 2004, the firm had secured contracts with over 200 clients—and by 2011, Asseco, the firm’s legal successor, had further increased its client number to about 400 (Asseco, 2011). Furthermore, drawing on its experience in the cooperative banking sector, the company managed to gradually extend its operations into other segments of the domestic financial industry. In 2003, 42 percent of the firm’s revenues already came from contracts with universal and retail banks—compared to 22 percent from the cooperative and regional banking segment (COMP Rzeszów, 2004).

In the mid-2000s, the company, which was now operating under the name of Asseco, built on its commercial success and took over two larger domestic EIT companies—both of which focused on more “high-profile” segments of the home market but were facing various growing pressures. *First*, in 2007, Asseco bought Softbank²¹, which had been providing IT solutions to the country’s main financial institutions since 1989. In the mid-1990s, Softbank’s key client was Poland’s largest bank, the state-controlled PKO BP, which selected Softbank’s proprietary software to support its retail operations (Szafranski, 2011). However, starting in the early 2000s, the company started facing difficulties in introducing new products and gradually refocused its business model on implementing and distributing third-party software provided by foreign vendors (Puls Biznesu, 2006). The firm’s increasingly difficult situation was related to the fact that in 1999, British-Japanese multinational ICL, the firm’s main technological partner, withdrew from the cooperation (Computerworld, 1999b).

And *second*, in 2008 Asseco acquired Prokom—at that time, Poland’s largest IT firm, which had been operating in the market since 1987. In its early years, the company provided various proprietary software products to domestic organizational clients in several market segments—from financial to

²⁰ Rzeszów is a city of around 200,000 inhabitants (as of 2017) located in south-eastern Poland.

²¹ Not to be confused with the Japanese multinational SoftBank, which was not related to the Polish integrator.

manufacturing. For instance, Prokom's ERP applications were implemented by several of the country's largest business enterprises—like KGHM, a globally active copper-mining company, or PZU, Poland's biggest insurance firm (Computerworld, 1999c). However, over the years, standard-software production became less important within Prokom's business model and the company focused more on developing tailor-made IT systems for large domestic clients—primarily state-controlled enterprises and governmental organizations. Perhaps the best example of Prokom's sales market strategy of the late 1990s was a huge computerization project implemented for the public Social Insurance Institution (ZUS). Implementation lasted a few years longer than planned²², and during this period, both Prokom and its cooperating foreign suppliers signed numerous additional contracts (e.g. IBM, Hewlett-Packard, Microsoft, SAP, Siemens; see: Computerworld, 2004b; Puls Biznesu, 2004c, 2005). While the value of the initially ordered IT system was at about 700 million PLN, Prokom's total revenues from the project as of 2008 were estimated at 2.1 billion PLN (Forbes, 2010). One important factor contributing to this increase pertained to the original contract terms agreed with ZUS, which allowed Prokom alone to make any modifications in the implemented system (PAP, 2007b). It was not until 2014 that Asseco Poland—as Prokom's legal successor—transferred the rights to the implemented IT system to the state-controlled insurer.

If we now take a look at Asseco's current sales market operations, it is evident that while the company has followed many of the paths opened by its predecessors (e.g., regarding its enduring focus on the domestic banking and public sectors²³), it has nevertheless largely redefined its strategy by expanding into various foreign markets. In 2012, the share of overseas revenues amounted to 70 percent of the group's total sales; and in 2016, the proportion further increased to 80 percent (Asseco, 2017e). One characteristic feature of Asseco's internationalization strategy is, however, that the company does not focus on exporting their own software products, and has also not established green-field subsidiaries abroad. Instead, Asseco has entered foreign markets by acquiring local software and services firms with their own well-developed client and product bases (Radło, 2012, 2016). Initially, the company focused on making acquisitions in Europe—Central, Southern, and Western (Kaszuba, 2010). But more recently, it has taken a more global approach. Perhaps most importantly, in 2010, the company took a controlling interest (50.2%) in Formula Systems, a NASDAQ-listed Israeli IT holding with significant operations abroad. Later, Asseco also extended its operations into emerging economies. Still pursuing the strategy of inorganic expansion, in 2015, the company acquired a controlling stake in a mid-sized Portuguese EIT vendor (Exictos SGPS) with a well-developed client base in several Sub-Saharan markets (Puls Biznesu, 2015).

5.2.2. The second case-study company

The second case-study company, Comarch, started operating as an independent software producer in the early 1990s when it developed IT support systems for Telekomunikacja Polska SA (TPSA)—the then state-owned Polish telecoms monopolist. The close collaboration with this client dated back to the activities of Comarch's founder and CEO as a researcher in the telecommunication division at AGH University in Krakow. The company also began producing software for other kinds of customers in the 1990s (e.g., banks, insurance companies, or SMEs), yet its primary field of activity during the first decade or so remained IT systems for the telecommunications sector.

Initially, the collaboration between Comarch and TPSA developed well, allowing the company to grow quickly and to significantly upgrade its technological capabilities. In 1993, TPSA commissioned

²² Officially, the development of the KSI ended in 2010, when Prokom no longer existed.

²³ However, the public sector has clearly been losing importance in the company's business model since Poland's new conservative government introduced a leaner IT procurement policy in 2015 (Bankier, 2017c).

Comarch to provide various technological analyses and feasibility studies for its planned computerization projects (Comarch, 2004a). A year later, the company received an order to develop a billing system for TPSA's satellite service (World Bank, 2007). Subsequently, the national telecom provider awarded Comarch further contracts for various tailor-made IT support systems—like a centralized database for its network inventory (in 1994), or a billing solution for its newly launched mass-market internet services (in 1996; Comarch, 2013). But Comarch's biggest contract with TPSA came in 1998, when the telecom company issued a tender for an IT system to support its operations in the Warsaw area—the country's largest territorial division in terms of the number of telephone users. The tender results were announced in August 1998, and TPSA decided to select Tytan—the standardized IT solution developed by Comarch. One of Tytan's advantages over its numerous competitors, as commentators noted, was the fact that the system had already been implemented in TPSA's other, smaller territorial division about a year earlier (Wolas, 2000).

However, the close cooperation between Comarch and the national telecom provider ended unexpectedly in the early 2000s, when TPSA decided to integrate all its regional billing systems in order to reduce costs (Puls Biznesu, 2001). And although Comarch—whose solutions were processing over 40 percent of the operator's total sales revenues—was often perceived as TPSA's preferred IT supplier, the telephone company decided to purchase an integrated billing platform from another domestic firm²⁴. This shift in procurement strategy led to dramatic revenue losses for Comarch. Available data indicate that in 1999, over 45 percent of the firm's overall income was generated by various contracts with TPSA (46.5% in the first half of 1999, see: Comarch, 1999b; Przybylska & Pilarska, 2005). In the following years, this proportion fell gradually and significantly: to 26.3 percent in 2001 and to less than 10 percent in 2003 (Comarch, 2002, 2004b, 2004c). Facing the withdrawal of its main organizational client, the company was forced to fundamentally revise its sales market strategy in a number of ways.

First, the company intensified its internationalization efforts. Comarch initially wanted to start selling its software products in the developed Western markets—which was a rather ambitious approach that would have meant going into head-on competition with numerous incumbent IT providers. In the early 2000s, the company entered the American telecommunications market and managed to sign a few relatively large contracts with governmental and private clients. Later on, however, the firm's North American operations clearly stagnated. Comarch's expansion into Western European markets was more successful. In Germany, where the firm has operated since 2000 (Comarch, 2000b), its sales strategy initially focused on delivering support systems to various niche operators (Przybylska & Pilarska, 2005). But within a few years, the company entered into several contracts with the country's largest mass-market providers—like o2, one of the country's dominant telecom firms, or E-Plus, a low-cost challenger (Comarch, 2003; PAP, 2010b). Comarch also pursued a similar market entry strategy in France from 2003, also focusing initially on local niche telecom providers (e.g., Auchan Télécom) (Przybylska & Pilarska, 2005). In general, looking back over 15 years and taking into consideration all the foreign markets where Comarch successfully gained a foothold, the firm's internationalization efforts can be considered relatively successful—given that its overseas sales already amount to over 50 percent of its total revenue (Comarch, 2017b).

But in addition to its quite ambitious internationalization strategy, Comarch has also focused on diversifying its domestic operations beyond the telecom industry since the 1990s and has developed a stronger presence in the domestic banking and public sectors²⁵. One particularly successful segment for

²⁴ Interestingly, the selected supplier was a subsidiary of Prokom.

²⁵ However, as in the case of Asseco, the role of the domestic public sector in the firm's revenues clearly diminished when the new conservative government introduced a leaner IT procurement approach after the parliamentary elections in 2015 (Computerworld, 2017).

the firm has been ERP applications for SMEs. In general, the Polish market for standard business software was dominated by MNCs from the start. For instance, in 1999, the three largest foreign vendors operating in Poland—SAP (Germany), Oracle (USA), and IFS (Sweden)—jointly captured over 50 percent of domestic demand (Computerworld, 2000a). However, these and other multinationals have not been able to penetrate all segments of the local market. And in particular, their position has been very weak in the SME sector. Predictably, this was related to the fact that smaller organizational clients in Poland often could not afford state-of-the-art solutions designed originally for users in high-income countries. In contrast to the MNCs, Comarch performed strongly in this sector, with SME revenues growing very dynamically from the early 2000s. In 2014, the firm controlled over 50 percent of the segment and thus became the second largest ERP vendor in the country (Puls Biznesu, 2017b).

5.3. Corporate finance

Turning now to the *corporate finance strategies* of the two studied firms, my analysis indicates that both have relied on the domestic capital market to finance their growth to a significant degree. At the same time, some clear differences in their strategies can also be observed, with Comarch following a hybrid approach and relying on both the stock market and bank-based finance.

5.3.1. The first case-study company

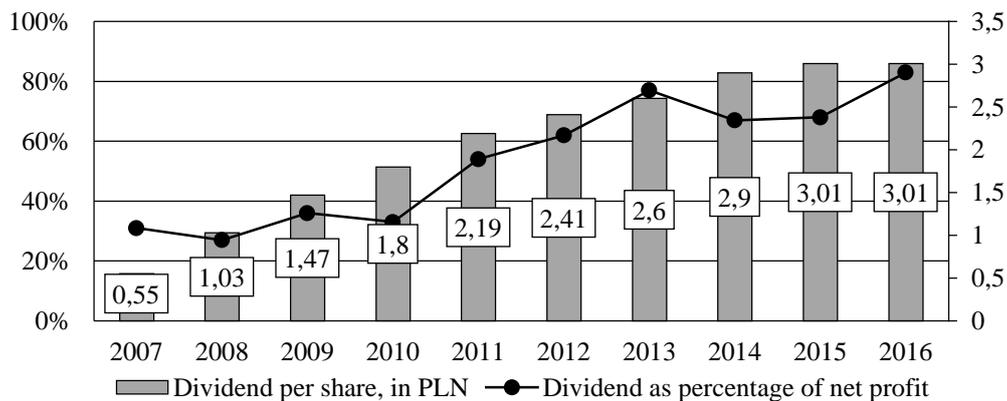
An important step in the Asseco Group's trajectory was when COMP Rzeszów, building on its commercial success in the cooperative banking sector, decided to go public through an initial public offering (IPO) on the Warsaw Stock Exchange in 2004. During the whole public-listing process, the company was supported by an American-financed private equity fund operating in Poland, Enterprise Investors (EI), who held a 50-percent interest in the firm from February 2003 (Kaszuba, 2010). Beyond advising the management on internal organizational matters, EI promoted COMP Rzeszów among potential investors and helped it to develop a positive media image (Matys, 2014; Puls Biznesu, 2004a). Building on this support, the company launched a successful IPO in September 2004: the initial offer was oversubscribed by some 15 times in the primary market, the first-day stock price exceeded the issue price by 28 percent, and the EI fund multiplied its investment more sevenfold by selling its 50-percent stake in the firm (Financial Times, 2005; Interia, 2004).

Since the IPO, Asseco Poland has largely relied on the stock exchange to finance its dynamic growth. Perhaps most importantly, the company has used the capital accumulated by issuing new shares on the WSE for its aggressive merger and acquisition strategy. As the firm's management already indicated in its 2004 prospectus, a key element of its development strategy in the mid-2000s was to use the income from issuing shares to acquire both domestic and foreign IT enterprises with relevant technological capabilities (COMP Rzeszów, 2004). For instance, when the company merged with Prokom (a WSE-listed company since 1997) in 2008, Asseco first entered into a credit agreement for up to 580 million PLN with foreign-owned bank BPH, and a few weeks later, when the merger was already settled, it issued a large volume of new shares (worth over 325 million PLN) targeted at various institutional investors in order to repay the debt quickly (Bankier, 2017a; PAP, 2007a; Puls Biznesu, 2007). In a similar manner, the purchase of the Israeli IT holding Formula Systems in 2010 was also financed through a large issue of stock on the WSE (worth about 270 million PLN)—with the main difference being that in this case, Asseco had already decided to issue the new shares in advance of the transaction (Asseco, 2010b; Bankier, 2017a; PAP, 2010a).

But the reliance on the stock market to finance the firm's growth has come at a price. Given the central role which share issues have played in the firm's development, Asseco has had to take various measures to maintain a high stock price and deliver "shareholder value." In general, the company has attempted to achieve these goals by implementing a generous redistributive agenda. For instance,

Asseco Poland has considered large stock-buybacks in order to boost its share price several times. So, in late 2011, when the firm's stock price on the WSE was falling, the shareholder meeting agreed to spend as much as 450 million PLN on repurchasing shares (PAP, 2011). However—for reasons not explicitly described in the collected material, but probably related to a spontaneous increase in the stock price—the instrument was ultimately not used by the management (PAP, 2014). Second, and much more importantly, the company has redistributed a large percentage of its income by means of regular and increasingly high dividend payments from the beginning (Kaszuba, 2010). In the very first year after its IPO, COMP Rzeszów paid out 35 percent of its profit as dividends. And later, between 2007 and 2016, dividend payouts at Asseco Poland amounted to about 54 percent of its annual income on average—reaching as much as 83 percent in 2016 (Asseco, 2017d; see Figure 8)²⁶.

Figure 8: Dividend policy at Asseco Poland 2007–2016



Source: Asseco (2017d)

At the same time, we should note that Asseco's financing strategy is not solely stock-market based, but also relies—to a certain degree—on bank credit. As mentioned above, bank-based funding played a supportive role in the company's large acquisitions, as in the case of Prokom. Nevertheless, a closer look at the firm's balance sheet ratios indicates that bank-based funding remained a secondary source of capital for the company. For instance, at the end of 2009, when the short-term loan used to finalize the Prokom merger had largely been repaid, Asseco Poland reported an outstanding bank debt of about 43 million PLN—which represented only 6 percent of its total liabilities and amounted to slightly over 1 percent of the total shareholder equity (Asseco, 2010a). And in 2016, when the company was paying off an investment loan taken to finance the construction of some new production facilities in Warsaw, Asseco's total outstanding bank debt stood at about 86 million PLN—which amounted to less than 2 percent of the shareholder's capital and represented about 17 percent of the firm's total liabilities (Asseco, 2017c). The relatively low reliance on credit indicated by these numbers becomes clear when we compare them to the values characteristic for companies in typical bank-based economies—for instance, in Germany, the average share of loans in firms' total liabilities amounted to as much as 43 percent in the early 2000s (J. P. Byrne & Davis, 2002).

²⁶ One should also note that the other WSE-listed companies within the Asseco Group (e.g., Asseco Business Solutions) followed somewhat less generous dividend policies than Asseco Poland.

5.3.2. The second case-study company

Let us now analyze the financial strategy of the second case-study company, Comarch. In early 1998, after relying primarily on internal funding²⁷ for the first few years, the company decided to list its shares on the Warsaw Stock Exchange (Comarch, 1999a). The management reasoned that becoming a publicly traded company would, for one thing, provide the firm with new opportunities to raise capital for product development or infrastructure investments (Comarch, 1999a), and, at the same time, would increase the company's prestige in the eyes of organizational clients (Computerworld, 1998a). Following several months of preparation, Comarch's IPO took place in May 1999, allowing the company to gather the targeted 14 million PLN in the primary market—with the initial offering oversubscribed by almost 20 times, a WSE record at that time (Comarch, 2000a). However, an important aspect of Comarch's IPO was that the company initially listed its shares on WSE's least prestigious market, the "free market" and progressed towards the main floor on a step-by-step basis (with an intermediary listing on the "parallel market"; Parkiet, 1999). We may speculate that the management's decision to enter the stock market through WSE's least demanding floor was related to the fact that Comarch did not have organizational and promotional support during the IPO process comparable to the support the EI fund provided to Asseco.

Following its IPO—and as we have observed in the case of Asseco—Comarch started using the stock market to finance its growth. In late 1999, the management decided to issue a significant number of new shares (increasing the equity capital by about 20 percent) in order to acquire funding for goals like the construction of production facilities in Krakow, software-product development, or expansion into internet-based services (Puls Biznesu, 1999). This first issue was targeted mostly at selected institutional investors and allowed the company to raise 70 million PLN for the planned investments (Bankier, 2017b; Comarch, 2000c). Similarly, in the early 2000s, the capital market played an important role in the firm's strategy for coping with the sudden withdrawal of its main organizational client, TPSA. When Comarch's share price fell to historically low levels in late 2001 and the firm urgently needed new funds to finance its internationalization, instead of simply issuing new stocks, it issued a large quantity of convertible bonds, which allowed the company to still raise a relatively large amount of new capital (Puls Biznesu, 2002). The offering was launched in April 2002, and the 4,000 five-year bonds were mostly acquired by institutional investors like the domestic pension funds (Computerworld, 2002b).

But at the same time, although Comarch has used the stock exchange to raise the required funds in many cases over the years, the firm's corporate financing was, in fact, not only oriented towards the capital market. This becomes especially clear when we compare Comarch's approach with Asseco's above-described approach. *First*, Comarch has issued new stock much less frequently than Asseco—in fact, as of late 2017 (when the data collection for this analysis ended), Comarch's last issue of shares to external investors had taken place in early 2006 (Bankier, 2017b). *Second*—related to the firm's generally lower reliance on the sales of new shares—Comarch's redistributive methods in order to deliver the "shareholder value" have been much less intensive. For instance, the management first decided to pay dividends in 2003, and did so for the second time almost a decade later, in 2012 (Puls Biznesu, 2012). A *third* important difference is the fact that, despite its public listing, Comarch has actually remained a family-controlled enterprise. Ever since the firm's IPO in 1999, the company's founder and CEO together with his wife have always owned a block of shares large enough to pass any proposal at the shareholder meeting. This was possible because Comarch has not followed the "one-share/one-vote" rule and has granted varying voting rights to different groups of shareholders. And

²⁷ This can be cautiously assumed based on the observation that no outstanding long- or short-term debt was reported by the company for the fiscal year preceding its IPO (i.e. for the time between 01.11.1996 and 31.10.1997 Comarch, 1999c); no detailed data was available for earlier periods.

finally, *fourth*, Comarch has developed a more “hybrid” corporate financing approach than Asseco, in that it has mixed market-based with bank-based funding. If we take a look at the balance sheets of Comarch SA²⁸ between 2008 and 2016, we will find that the share of bank debt in the firm’s total liabilities was quite high—amounting, on average, to 44.5 percent (Comarch, 2010, 2012, 2014, 2016a, 2017a)²⁹. This is a much higher level than is evident for Asseco Poland (17 percent in 2016)—and is similar to what the existing literature has observed among business enterprises in Germany, the typical bank-based economy (about 43 percent in the early 2000s; see: J. P. Byrne & Davis, 2002).

5.4. Productive organization

Finally, let us discuss the productive organization strategies followed by the two case-study companies. By “productive organization,” I mean the scope of value-chain activities performed by the firms in-house as distinct from the inputs acquired externally. My analysis of the collected historical material indicates that the two studied firms’ productive strategies have been deeply embedded in the transnational, “modularized” production system of the EIT industry. Both have focused on the production of higher-level business applications and the provision of related services and both have sourced the more infrastructural components through collaborations with foreign MNCs. At the same time, there is some evidence that the productive and innovative activities of the two firms have relied—and perhaps increasingly rely—on domestic institutional support.

5.4.1. The first case-study company

The productive models developed by Asseco’s three predecessor firms (COMP Rzeszów, Softbank, Prokom) largely relied on externally acquiring technologies from various global suppliers. The *first* of the three companies discussed here, Softbank, was even majority controlled by the British-Japanese IT multinational ICL for a few years after 1993. The development of relatively competitive financial software by the Polish firm in the early 1990s greatly benefited from the transfer of state-of-the-art proprietary technologies by ICL (Kubielas, 2004; Linden, 1998). In addition, the two parties also entered into an agreement designating Softbank as the exclusive distributor of ICL’s hardware in the Polish financial sector (Kubielas, 2000). However, at the end of the 1990s, when ICL withdrew from the partnership (Computerworld, 1999b), Softbank faced serious difficulties in bringing new products to the market. The *second* firm acquired in the mid-2000s by Asseco, Prokom, followed a very similar productive organization strategy. The relatively successful software products developed by the company from the early 1990s onwards—like its ERP applications or support systems for retail banks—were based on various high tech inputs supplied by foreign, mostly American vendors (Computerworld, 1993; Kubielas, 2004). And like Softbank’s partnership strategy, Prokom’s strategy also combined technological cooperation with distributive agreements focused on selling the MNCs’ products in Poland (Kubielas, 2004; Radošević, 2004). And finally, *third*, the business model of Asseco’s direct predecessor, COMP Rzeszów, also relied on a close cooperation with foreign technology suppliers. In this case, however, the software products developed by the Polish company proved more successful in the long run. Around 1995, COMP Rzeszów entered into a strategic partnership with Oracle—the American producer specializing in database-management systems (COMP Rzeszów, 2004). According to the agreement, COMP Rzeszów became a local integrator and distributor of various Oracle products (e.g. as a services company developing on-demand data warehouses for local financial institutions; Computerworld, 1998b). But at the same time, the alliance with Oracle allowed the company to produce

²⁸ This is the dominant unit within the Comarch Group.

²⁹ We may also note that the loans were granted to the company by both foreign-owned and domestic banks.

its own proprietary software based on the partner's components and engineering tools—as was the case, for instance, with COMP's support systems for the domestic financial sector (COMP Rzeszów, 2004).

Looking at the productive organization at Asseco today, we find both some continuity with the predecessor companies and an ongoing transformation towards more self-reliant software production. The company still remains focused on the development of higher-level business applications and on the provision of related integrative services. Complementing these in-house capabilities, the firm maintains external collaborations with foreign technology providers in order to secure the supply of the infrastructural software components (e.g., databases or middleware) required to deliver EIT systems for various organizational clients (see e.g. Asseco, 2011, 2013). Moreover, when developing its own business applications, Asseco also relies on technologies supplied by MNCs. To take a relatively recent example, in 2009, the company signed a large partnership agreement with IBM allowing all its (Asseco's) software-producing subsidiaries to employ middleware components developed by the American giant (Wirtualnedia, 2009).

But on the other hand, there are some indications that the company, while maintaining the same value-chain scope, has nevertheless largely upgraded its in-house technological capabilities in the field of business applications development. The company has achieved this, *first*, through an asset-seeking acquisition program, both domestically and abroad. For instance, between 2006 and 2007, the company established a new subsidiary by merging a few smaller Polish and German ERP producers—Asseco Business Solutions, which specializes in the production of software for SMEs (Computerworld, 2007; Interia, 2006). And *second*, in addition to the inorganic development, Asseco seems to have recently intensified its own R&D activities. One general indication of this is the company's position in the European Commission's ranking of the largest EU R&D investors—the company has jumped from 902nd position in 2009 to 656th position in 2017 (European Commission, 2009, 2017). Moreover, there is some evidence that the firm's R&D activities are becoming increasingly embedded in domestic and EU-wide institutional structures. For instance, more than 30 percent of the firm's latest investment in an IT "Innovation Hub" in Rzeszów (worth about 80 million PLN and creating 400 new R&D jobs³⁰) has been financed by the Polish state from EU funds (Asseco, 2017b). In addition, the company has also started developing more intensive research collaborations with academic institutions. As observed by Melnarowicz (2017), based on his interviews with Asseco's managers, while the company still perceived this kind of cooperation as rather unproductive in the mid-2010s—primarily due to the slow pace and abstract nature of academic research—more recently, it has decided to launch various projects with several domestic universities.

5.4.2. The second case-study company

As I have described above, at the beginning of its operation as an independent company, Comarch largely focused on the development of proprietary IT solutions for various kinds of organizational clients—and primarily, for the telecoms sector. However, an important aspect of the firm's early production model was its high reliance on platform technologies provided by multinational EIT companies. And particularly during its first decade or so, Comarch used software components supplied mainly by one foreign vendor: the American giant Oracle. For instance, the support systems for telecom operators that the Polish firm introduced in the mid-1990s—like the Tytan billing platform developed initially for TPSA—used Oracle's relational database-management systems (Computerworld, 2001; Markowski, 2005; Parkiet, 2002). Comarch's early ERP applications both relied on Oracle's databases and were designed with the aid of toolkits provided by this producer (Computerworld, 1999a). Moreover, in

³⁰ This investment provides one significant indication regarding the firm's human-capital strategy. When launching the new R&D center, Asseco plans to create a large number of high-skilled jobs in the region—which signals the firm's confidence regarding the local availability of an adequately qualified workforce.

addition to using Oracle's platform technologies for their own software production, Comarch's cooperation with the American firm also included integrative services. When developing various on-demand IT systems for large domestic clients (e.g., data warehouses for financial institutions), the Polish company often simply implemented standardized solutions provided by Oracle (see e.g. Computerworld, 2004a; Puls Biznesu, 2000). Comarch's founder and CEO emphasized that this close and multidimensional partnership with the American giant proved very beneficial in the long run, because Oracle's products—in contrast to those offered at that time in Poland by other firms, like Informix or DEC—have since become industry-wide standards (Comarch, 2013).

When we now look at Comarch's business model since the 2000s, we find both a clear continuity with the firm's earlier strategy of platform-based software production and various indications of an ongoing upgrading of the firm's technological capabilities. Regarding the *first* aspect, Comarch, as a software-product company, has remained focused on the development of various higher-level business applications, and still acquires infrastructural components through collaborations with MNCs. Throughout the years, the only change in the value-chain collaborations is seemingly an increasing diversity of the company's key-supplier base. For instance, in the early 2000s, Comarch—while remaining an important local partner of Oracle— had already entered into a close cooperation with Microsoft (Computerworld, 2002a). Like the alliance with Oracle, this alliance also encompassed multiple activities. Perhaps the most important aspect for Comarch's development as a software producer is that the Polish firm has been able to use Microsoft's platform technologies (primarily the .NET-framework and the database management system SQL Server) to develop its new ERP applications (Computerworld, 2009). But at the same time—and like the earlier partnership with Oracle—Comarch has also acted as a local reseller and integrator of the MNC's products in Poland in this case (Bankier, 2003a).

Regarding the *second* above-mentioned aspect, the collected material indicates that Comarch has put much effort into developing technological capabilities within the scope of its value-chain specialization. Remarkably, when doing so, the company has only relied on mergers and acquisitions to a limited degree. In fact, Comarch's largest domestic takeover to date took place in the early 2000s, when the company purchased another indigenous ERP producer—a mid-sized company named CDN, worth between 15 and 20 million PLN (Bankier, 2003b; Computerworld, 2000b). This takeover meant the enterprise extended its productive capabilities in the segment of less expensive business applications for SMEs (Puls Biznesu, 2004b). In the foreign markets, Comarch's merger and acquisition program has also been rather modest. The company's most significant takeover abroad took place in 2008, when, for about 11 million euros, it acquired a German ERP vendor, SoftM AG—again, primarily in order to obtain some new assets in the field of software for SMEs (Computerworld, 2008).

Much more significant for the upgrading of the firm's technological capabilities have been its investments in its in-house production base. Probably the most visible manifestation is the ongoing development of the company's main R&D campus in Krakow, where Comarch currently employs about 3,000 people—more than a half of its global workforce (Comarch, 2017c). The project began in 1999, when the firm received a permission to move its operations into the local Special Economic Zone³¹—the “Kraków Technology Park” (Comarch, 2000a). Since then, the company has invested huge resources in developing various production facilities in the zone—with the last one (as of late 2017) being a laboratory for software and hardware from the “internet of things” segment, worth over 70 million PLN (Puls Biznesu, 2017a). Apart from the infrastructural investments, another indication of the firm's upgrading efforts has been its R&D collaborations. Early on, the company started to build alliances with local academic institutions—like the AGH (its CEO's alma mater), or the Cracow University of

³¹ Special economic zones in Poland are territorially delimited areas within which the state creates preferential investment conditions for the private sector (e.g., tax benefits or subsidized infrastructure).

Technology (Kozioł-Nadolna, 2013). And more recently, Comarch has also entered a cooperation with several foreign European universities—in most cases supported by EU-financed frameworks for joint business-academic R&D projects in the IT sector (Kozioł-Nadolna, 2013).

6. Summary and conclusions

The purpose of the present study was to throw light on the relatively successful development of the homegrown IT industry in Poland. As I have explained in the introductory section, this phenomenon is interesting in theoretical terms, because it runs counter to the existing literature on economic systems in postcommunist Central Europe emphasizing the region's dependence on FDI for industrial development. The point of departure in this analysis was the simple observation that the case of the relatively successful indigenous IT sector in Poland must represent a different mode of economic coordination than the one described in the theory of "dependent market economies"—one based on different kinds of domestic and transnational institutions (Nölke & Vliegenthart, 2009).

When developing the empirical analysis, I pursued a twofold goal. *First*, I attempted to reconstruct the historical trajectories of the two key players in the Polish IT industry, Asseco and Comarch. And *second*, in doing so, I wanted to find out what kind of institutional structures the firms' corporate strategies relied on and in what way. My general hypothesis in the analysis has been that in order to explain the companies' relatively successful growth we need to focus on the interplay between the home-country institutions and the sector-specific mode of governance.

In the third section of the paper, I reconstructed the relevant characteristics of the *modularized production regime* of the contemporary EIT industry and made two broad suggestions regarding the sectoral "windows of opportunity" towards which latecomer firms like Asseco and Comarch were likely to have gravitated. First, I have pointed to the increasing importance of integrative services within the EIT value chain—which is a sub-segment particularly important for emerging-market players. And second, I emphasized the lowered technological entry threshold into autonomous software production related to the sector's vertically specialized division of labor. My subsequent observations in the empirical part of the paper have shown that the two companies have indeed taken advantage of the new sectoral entry opportunities. Both Asseco and Comarch have consistently focused on the production of higher-level business applications and, at the same time, have acted as local IT integrators cooperating with MNCs. A crucial role in the development of the two companies' proprietary software was played by partnerships with technology suppliers such as Oracle, Microsoft, or IBM. As I have shown in the analysis, the EIT solutions delivered by Asseco and Comarch have used various externally sourced components, such as relational databases or middleware. But as the analysis has shown, while relying on imported foreign technologies in their productive activities, the two studied firms have nevertheless become active innovators within their value-chain specializations—for instance, by developing business applications suited to the needs of local financial clients or SMEs. In this sense, the analysis provides an indication of catching-up opportunities for emerging-market players related to the modularization processes within high-tech industries.

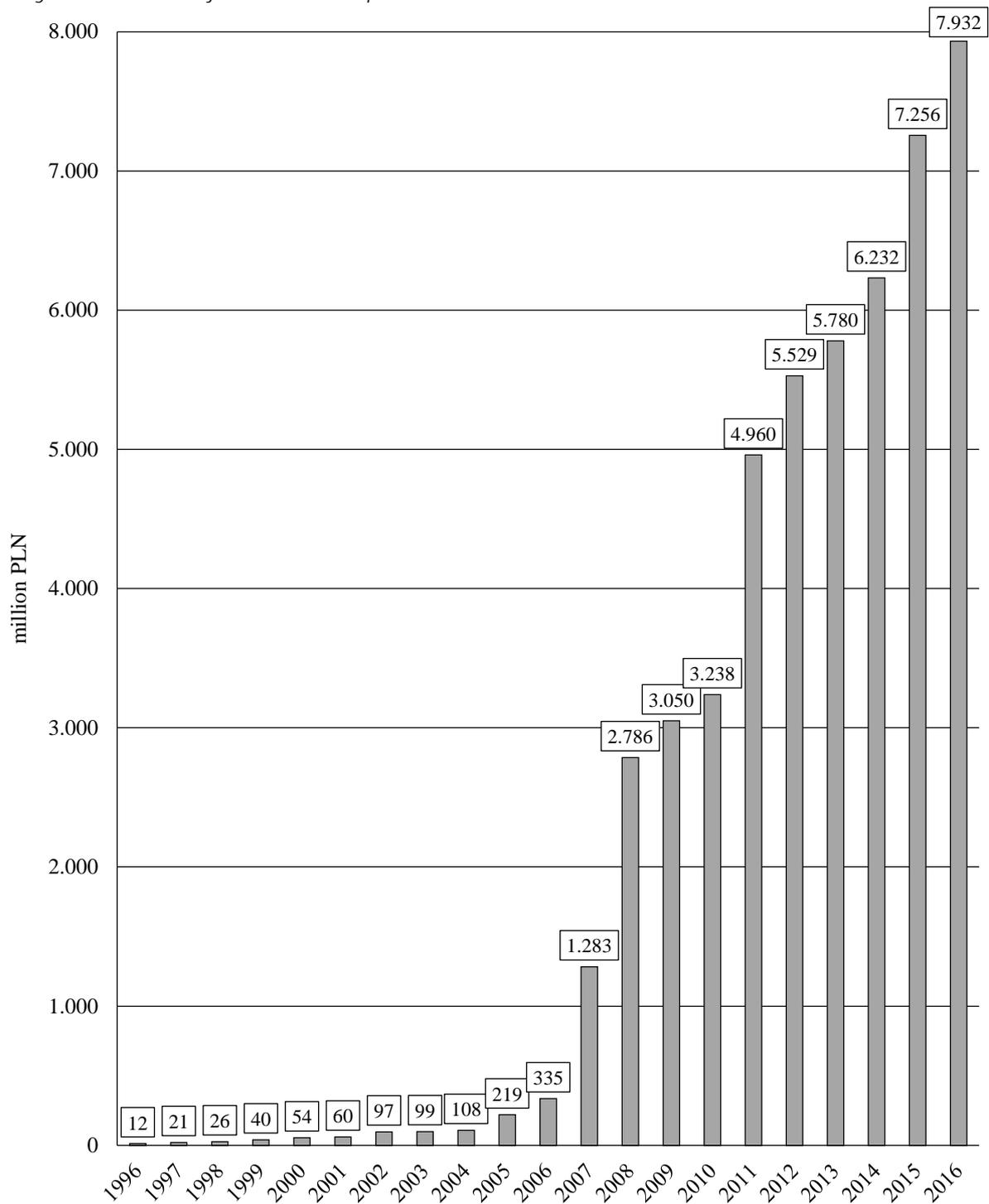
In the fourth section of the paper, I used a sector-in-country perspective in order to reconstruct the general "fit" between the hypothetical corporate strategies of indigenous entrepreneurial EIT firms and the relevant characteristics of the Polish national-institutional framework. In the following sections of the paper, I used these insights to guide my empirical analysis of the trajectories of the two case-study companies. The conducted studies have shown that the firms' relatively successful growth was significantly conditioned by the characteristics of the national institutional framework. First, regarding the *sales market operations*, various niche segments in the domestic EIT market were

important for both studied firms; these niches allowed the companies—particularly in the early phases of their development—to grow unexposed to competitive pressures from MNCs. The firms’ early “niche” specializations allowed them to upgrade their technological capabilities and to introduce some relatively competitive products. In both analyzed cases, however, the role of the domestic market niches has diminished over the years—as has the role of the domestic market in general. Second, regarding *corporate finance*, the analysis has shown that both studied firms have relied on the domestic capital market to finance their growth. This finding generally confirms the expectation developed in the fourth section, according to which the relatively well-functioning stock exchange and private equity market in Poland should be able to supply the needed risk-tolerant funding to entrepreneurial EIT firms. And finally, third, there is also some (although, admittedly, rather unsystematic) evidence that the *productive activities* performed by the firms within their value chain specializations have become increasingly embedded within relevant domestic support structures. As I have observed in the case of both Asseco and Comarch, the companies have upgraded their in-house capabilities, building on the resources provided by the state and, more recently, the EU. In this regard, the analysis indicates that a more thorough investigation of the country’s innovation regime and its recent changes is needed—more thorough, indeed, than was possible within this present paper.

In general, this study’s contribution to our understanding of the economic systems in postcommunist Central Europe is that Poland presents a more complex case than it has been assumed in the DME theory. The relatively successful growth of the studied firms has largely relied on local institutional structures whose role for industrial development has been almost entirely overlooked by Nölke and Vliegenthart (2009). At the same time, however, one must emphasize that—broadly corresponding to the general idea behind the DME theory—the entrepreneurial success of the domestic EIT firms was enabled by their embeddedness within transnational production networks and collaborations with foreign suppliers.

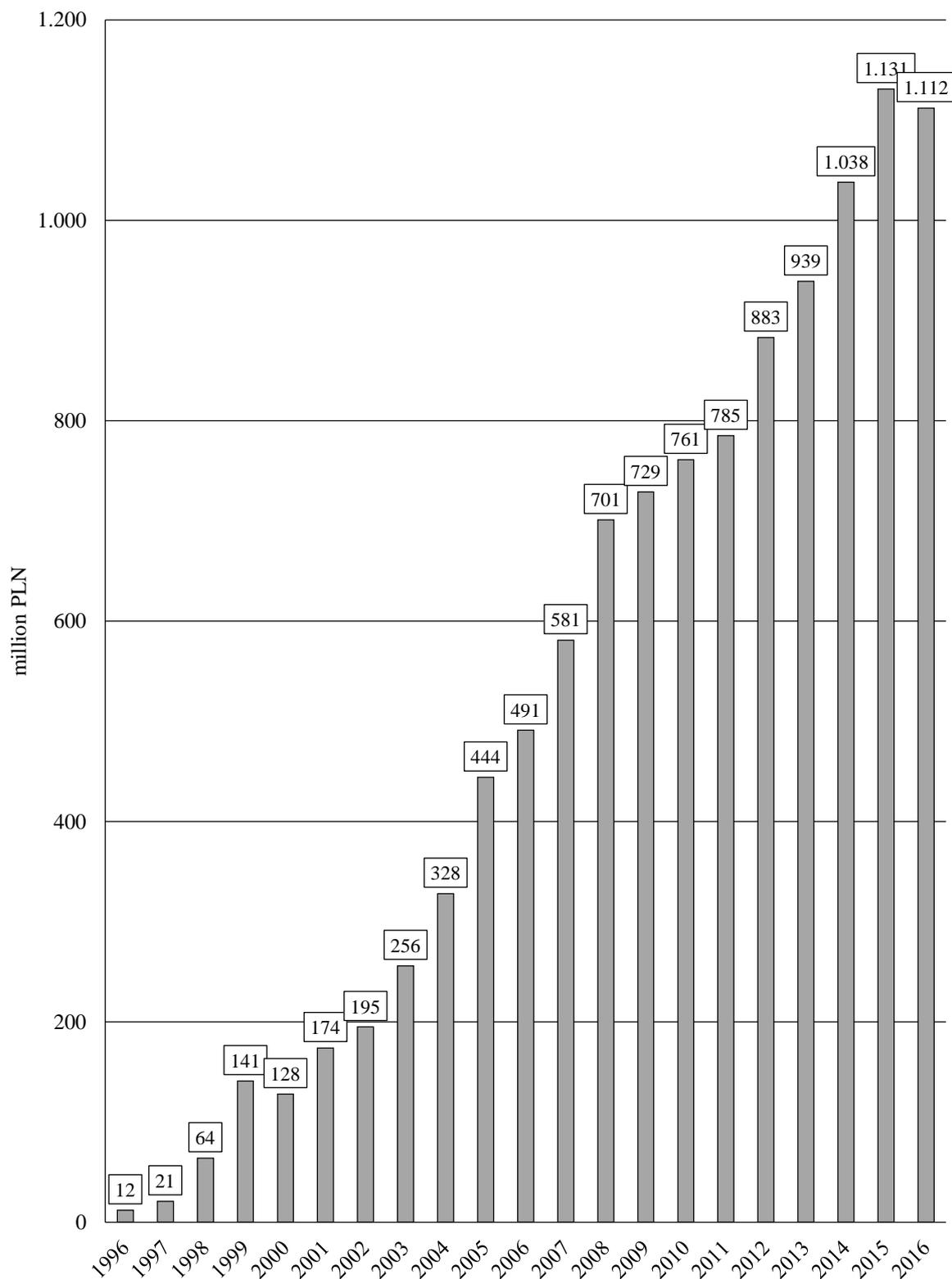
7. Appendix: historical revenues of the two case-study companies

Figure 9: Revenues of the Asseco Group 1996–2016



Note: between 1996–2005 COMP Rzeszów; for 2006: Asseco Poland before its merger with Softbank.
Sources: Asseco (2007, 2008, 2017a); Computerworld (2006)

Figure 10: Revenues of the Comarch Group 1996–2016



Sources: Comarch (2016b, 2017b); Computerworld (2005)

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